

Perceived Social Support in Persons With Heart Failure Living With an Implantable Cardioverter Defibrillator: A Cross-sectional Explorative Study

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What's new

- This large registry-based study showed that the vast majority of people living with HF and an ICD/CRT-D experienced a high perceived social support.
- Cohabiting was the greatest predictor of high perceived social support, but there seem to be gender differences and cohabitating might not give women as sufficient social support as seen in men with HF and an ICD/CRT-D.
- Our study underlines the complex relationships between perceived social support, mental health, and perceived control over the heart condition that should be acknowledge when supporting persons with HF and an ICD/CRT-D.
- When caring for persons with HF, and especially women, it is important to include incorporating pertinent family caregivers when designing psychoeducational support.

Perceived social support in persons with heart failure living with an implantable cardioverter defibrillator: a cross-sectional explorative study

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We have no conflict of interest to declare.

Abstract

Background

The links between chronic illness, psychological well-being, and social support have previously been established. Social isolation and loneliness have shown an increased mortality risk for those with heart failure (HF). Increasingly more people with HF are living with an implantable cardioverter defibrillator (ICD), but only a few small-scale studies have focused on social support in this population.

Objective

The aim of this study was to explore factors related to perceived social support in a large cohort of individuals with HF living with an ICD.

Methods

All eligible adult ICD recipients in the Swedish ICD registry were invited to participate in this cross-sectional study. For this analysis, those with HF and complete data on perceived social support were included (N = 1550; age, 67.3 (SD, 9.8) years; 19.5% female).

Results

Most reported a high level of social support, but 18% did not. In logistic regression, living alone was the greatest predictor of low/medium support. Lower social support for those living alone was associated with poorer perceived health status, having symptoms of depression, and experiencing low perceived control. For those living with someone, lower support was associated with female gender, symptoms of depression and anxiety, and less control. Heart failure status and perceived symptom severity were not related to the outcome.

Conclusion

One in five participants reported low/medium social support. Our study underlines the complex relationships between perceived social support, psychological well-being and perceived control over the heart condition. Multiple aspects need to be taken into account when developing interventions to provide psychosocial support and optimize outcomes in this patient group.

Key words: cardiac implantable electronic devices, heart failure, living arrangement, perceived social support, psychological distress

Introduction

Implantable cardioverter defibrillators (ICDs) are an evidence-based therapy for individuals at risk of ventricular arrhythmias (1-3), with heart failure (HF) being the most common underlying condition for implantation of an ICD (4). The consequences of HF extend beyond the physical symptoms and, in many persons, also have detrimental effects on psychosocial well-being. Symptoms of depression and anxiety are common in persons with HF (5, 6) as well as in persons with an ICD (7). In the context of HF and ICD, symptoms of depression have been linked to poor perceived social support (5, 8). Furthermore, it has been suggested that the risk of having low perceived social support is higher for those with an ICD compared with those with HF (9). Structural support seems to affect social support favourably, in that perceived social support has been reported to be higher for those who are married, and lower for those living alone (8, 9).

Monitoring and managing symptoms and engaging in self-care behaviours such as exercise and treatment adherence have been recognised as being more complicated when social support is poor (3). Social isolation, social relationship quality, and loneliness have been linked to an increased risk of mortality (10-12), equal to clinical factors such as elevated blood pressure and cigarette use (10, 12). Thus, sufficient perceived social support could be essential to optimize patient outcomes in persons with HF and an ICD.

Within the cardiovascular field links between social support, chronic illnesses, quality of life (QOL), and psychological distress have been well studied (13-16). According to the theory by Uchino (17), the links between social support and health related outcomes are complex and possibly reciprocal. To our knowledge, only 2 studies have focused on social support in HF patients with ICDs (5, 18), both on a relatively small scale (N=57-108). Accordingly, the

aim of this study was to explore factors related to perceived social support in a large cohort of individuals with HF living with an ICD or a cardiac resynchronization therapy defibrillator (CRT-D).

Method

Study design, sample and data collection

This study had a cross-sectional design based on self-reported data. All eligible adults (N=5,535) listed in the Swedish ICD and Pacemaker Registry in 2012 who had an ICD or a CRT-D implanted for at least 6 months were invited to participate. Those who had accepted participation were mailed a survey with a self-addressed stamped envelope for its return. One reminder was mailed after 3 to 4 weeks (19). A total of 3067 responded, giving a 55% response rate for all ICD/CRT-D recipients in Sweden at the time. This study is a subgroup analysis of the 1606 who reported they had HF, of which 1550 (96%) had complete data on the outcome variable.

Ethical considerations

The study conforms to the Declaration of Helsinki (20) and has been approved by the regional ethic committee for human research (2011/434-31). The participants were informed that they could contact the researchers, by telephone or e-mail, with any study-related questions. All ICD clinics in Sweden were informed about the study by mail and were asked to provide a contact within the local ICD team if participants needed one.

Measures

Demographic and clinical variables concerning the indication for an ICD (primary vs. secondary), type of ICD treatment (ICD vs. CRT-D) and time since implant were collected

from the registry. Demographic and clinical data were self-reported and included gender, age, living arrangements, shock experience, coexisting health problems, and perceived severity of HF symptoms.

Perceived social support was measured using the Multidimensional Scale of Perceived Social Support. This scale consists of 12 questions in 3 subscales concerning support from family, significant others and/or friends using a Likert-type scale where 1 means very strongly disagree and 7 means very strongly agree. A higher score indicates a higher level of perceived social support. The construct validity and reliability have been supported in both subscales and total score (9, 21-23), and it has also been evaluated in a Swedish context (24). In this study, we have used the total scale to dichotomize perceived social support into low/medium support and high support. A value of greater than 5 indicates a high level of perceived social support, whereas a value of 5 or less indicates a low/medium level of perceived social support. The developer of the MSPSS, Gregory Zimet, concurred with this decision (personal contact).

Perceived control was measured with the four-item Control Attitudes Scale (25). It has shown sound psychometric properties in a Swedish context with patients with HF and ICD, with the recommendation of using the scale as a 2-component instrument, that is, using the subscales Control and Helplessness and not the total score in analysis. It is a 7-point Likert scale and each component gives a maximum score of 14 (25, 26).

Symptoms of depression and anxiety were assessed using the 14-item Hospital Anxiety and Depression Scale, which has been used extensively in both hospitalized and non-hospitalized patients (27-29). The use of 8 or more as a cut-off point in both dimensions has been found to indicate psychological distress (28).

Health status was measured using the second part of the validated Swedish version of EuroQoL-5D, the Visual Analogue Scale. Here, respondents can indicate their subjective health status on a vertical scale marked from 0 to 100, where one end (100) represents “best imaginable health state” and the other end represents “worst imaginable health state” (30, 31).

Data analysis

IBM SPSS Statistics version 24 was used for analyzing data. Frequencies and proportions were used to describe data and to explore differences between groups (i.e. low/medium or high level of perceived social support). Independent 2-tailed Student's *t* tests were used on continuous variables and X^2 tests were used when data were categorical. Living arrangements was predichotomized into either those who lived alone or those living with someone. Time since implant was predichotomized into those who had their implant for more or less than 3 years (median). The variable concerning receiving shocks from the ICD was predichotomized into either having received a shock or shocks or not having received a shock. A $P \leq .05$ indicated statistical significance. We performed logistic regression (enter method) to determine factors associated with perceived social support, predichotomized into perceived low/medium and high levels of support. Independent variables in the initial regression model were chosen based on clinical and theoretical relevance and the results from bivariate analyses, with all variables with a $P \leq .05$ included (Figure 1). After checking for possible interactions between the independent variables, helplessness was associated with both control and depression. Hence, we performed 2 separate models (1 with helplessness included and 1 with helplessness excluded, but with the same significant variables remaining). In the results, the model without helplessness is presented. In an iterative process, nonsignificant variables

were excluded one by one to reach a final model with only the significant variables remaining.

Results

Patient characteristics

In total, 1550 participants were included with a mean age of 67.3 (SD, 9.8) years. The sample ranged from 21 to 89 years and 19.5% were women. Of the whole sample, 65.2% experienced either slight or much discomfort from their HF symptoms. Approximately half of the participants had received their ICD (52.1%) as secondary prevention. Time elapsed since ICD implementation varied between 1 and 23 years, with 56.9% having had their ICD for less than 3 years. Most persons shared a household (78.5%), and most had one or more co-existing health problems (89%) (Table 1). More women than men lived alone (29.3% vs. 19.6%, $P \leq .001$), and those living alone also reported more coexisting health problems than did those cohabitating (2.86, SD 1.95 vs. 2.52, SD 1.82, $P \leq .05$).

Overall, 11% of participants scored 8 or higher for depressive symptoms and 18.6% for symptoms of anxiety. The EQ-5D Visual Analogue Scale mean score was 67.9 (SD 18.7), and perceived control and helplessness in relation to their heart condition was scored at 8.9 (SD 3.0) and 6.4 (SD 3.2) respectively (Table 1).

Perceived social support

Participants reported a mean score for perceived social support of 5.96 (SD 1.2). In total, 17.6% experienced a low/medium level of social support (n=273), whereas the reminder experienced a high level of social support (n=1,277). The least support was derived from friends, with 32.3% reporting a low/medium level of perceived social support from this

group, whereas the corresponding percentages were 16.4% for family was and 15.1% for significant others. In bivariate analyses, participants with low/medium levels of social support were more often younger ($P \leq .05$), female ($P \leq .05$), living alone ($P \leq .05$) and had more often experienced a shock/shocks from their ICD ($P \leq .05$) compared to their counterparts. They also reported more coexisting health problems ($P \leq .05$), perceived a lower level of control ($P \leq .05$) and felt more helpless in relation to their heart condition ($P \leq .05$), had more symptoms of depression ($P \leq .05$) and anxiety ($P \leq .05$), and had a poorer health status indicated in the EuroQoL Visual analogue Scale ($P \leq .05$). Perceived severity of HF symptoms was not significantly associated with poorer levels of perceived social support (Table 2).

Factors associated with low/medium levels of social support

The multiple logistic regression model predicted that the odds for persons perceiving low/medium levels of social support were higher for those living alone, those having depressive symptoms, those having symptoms of anxiety and those feeling less control in relation to their heart condition. Living alone was the strongest independent variable associated with perceived low/medium levels of support in this model (Odds Ratio 7.31). Age, gender, whether or not the person received a shock from the ICD, health status and coexisting health problems were not significantly associated with the outcome (Table 3).

Given our findings, which indicated that those living alone had greater odds of experiencing low/medium levels of social support compared with those who were cohabitating, we conducted a secondary logistic regression analysis to further explore this phenomenon and determine independent variables associated with low/medium levels of social support in those living alone and those cohabiting separately. Different sets of associations were significant, depending on household status (Table 4). The multiple logistic model predicted that the odds

of perceiving low/medium levels of social support in those living alone were higher for those indicating lower health status, having symptoms of depression and experiencing lower levels of perceived control. For those living with someone, the odds of low/medium levels of support were higher for females, those having symptoms of depression and anxiety, and those experiencing less control.

Discussion

In the current study, perceived social support was examined in a large cohort of individuals living with an ICD/CRT-D. The vast majority experienced a high level of support. This is consistent with what most people in Europe state that they are satisfied with their personal relationships, and 93% report that they have someone to rely on when they need it (32). However, nearly every fifth individual in our cohort reported insufficient perceived social support. Insufficient support was in turn related to living alone, experiencing more symptoms of depression and anxiety, and lower perceived control in relation to the heart condition. Thus, it is imperative to identify those at risk of low levels of social support, particularly since previous studies also have found links between chronic illnesses, quality of life, psychological distress and social support (13-15) and that social support could affect survival (12).

Our findings, with cohabiting status being the most important independent variable associated with low/medium levels of support, indicate the importance of structural support (e.g. networks) (33). In earlier studies, cohabiting and being married have been associated with a higher level of perceived social support (8) and lower levels for those without a partner (9). This might seem self-evident, but interestingly – in women when compared with men – cohabiting was associated with lower levels of perceived social support in our study. One

influencing factor could be that women might perceive loneliness more often than men (34). Loneliness entails feeling alone without necessarily being alone, which could explain why some cohabiting women did not perceive being socially supported. Since women report more psychological distress than men do in our study, and since depression and perceived social support have been associated with each other (8), another theory is that these factors also negatively influence the reception and utilization of social support.

Earlier studies have shown inconclusive results regarding gender and vulnerability. In 1 study, men reported lower levels of social support than women with HF (35), whereas another study involving ICD recipients indicated that gender was not correlated to social support in either persons with HF or persons with an ICD (9). In a small study including persons receiving an ICD, women reported lower values for social health variables initially, but at follow up 6 months after implantation, they reported higher scores compared with men (36).

Symptoms of depression and anxiety were common in our cohort, and these results corroborate the findings of other studies (5, 7). Symptoms were even more common for those with low/medium perceived levels of social support. Surprisingly, self-reported severity of HF symptoms did not differ when comparing persons with low/medium and high levels of support in bivariate analysis. More severe HF status has been linked to lower levels of social support (35). On the other hand, being married or cohabitating and experiencing emotional support may mean less severe physical HF symptoms (33). In our study there is a high prevalence of persons with CRT-D, and it might be that these persons experience physical improvement (37) incomparable to those with an ICD only and that these factors together diminish the differences in HF status between those with low/medium and high perceived levels of social support. Shen et al. also found that depression and anxiety predicted a decline

in physical function in persons with HF (50% of the sample had an ICD) but social support did not (38). Since depression and anxiety and sense of control differed between those experiencing high levels of social support and those experiencing low/medium levels of social support in our study, a plausible explanation is that our data indicate that perceived and structural social support (and possibly CRT-D) could protect against detrimental effects of psychological and physical distress, in that it buffers or exercises a direct effect on mental and physical health (39, 40). It could be that social support functions as a coping mechanism that provides support through, for example, affecting the facts of the situation (eg, practical assistance) or the emotional response (eg, anxiety) towards the life situation (41). One note of caution in connection with the conclusions drawn here is that earlier studies have seen a mediator effect indicating that social support affects quality of life through the mediating influence of depression status (42) and that symptoms of depression and perceived social support could have an additive effect influencing, for example, event-free survival (8) indicating that relationships and pathways between psychosocial and physical measures are complex.

Limitations and strengths

Limitations of this study include the cross-sectional design and the use of self-reporting instruments. Thus, we can only report association rather than inferring causation. Only 1 data collection point was used, and a longitudinal study of a cohort of patients would be helpful in understanding the process of device adjustment, psychosocial distress and perceived social support over time. Half of the participants had their ICD implanted as a secondary form of prevention. This is a relatively high rate for current practice, which could be seen as a limitation, but mirrors the fact that the time since implantation ranged up to 23 years. Strengths of the study include the high response rate, a large nationwide and representative

sample size with 20% women, age between 21 and 89 years, and a wide range of time since implantation.

The total score from the Multidimensional Scale of Perceived Social Support was used in the analysis. This might be a potential weakness since the translation and validation of the instrument in a Swedish setting has imposed this as being less valid than using the subscores for family, significant others and friends (24). Still, in several other studies (21, 22, 43), using the total score has been supported. For the logistic regression we dichotomized the Multidimensional Scale of Perceived Social Support variable into those with low/medium levels of support and those with a high level of support. We acknowledge that the cutoff point is a possible source of weakness but think the value of ease in interpretation is important considering the purpose of this study and since groups differed in measures.

Conclusion and clinical implications

One in 5 patients with HF living with an ICD reported low/medium perceived levels of social support. Cohabiting was the greatest predictor of high perceived level of social support, but further analysis revealed that this might not be true to the same extent for women. Clinicians should be extra attentive to the fact that there could be gender differences and that cohabiting might not protect women to the same extent. When caring for persons with HF, and especially women, it is important for these reasons to include pertinent family caregivers when designing psychoeducational support in order to strengthen the social support given to the person with an ICD/CRT-D and HF.

Lower levels of social support in those living alone were associated with poorer health status, having symptoms of depression and experiencing lower levels of perceived control. For those living with someone, lower levels of support were associated with female gender, symptoms

of depression and anxiety, and less control. Heart failure status and symptom severity were not related to perceived social support, and it could be that there are factors not studied that mediate or moderate effects. Further longitudinal studies in this cohort could possibly illuminate the pathways.

A possible way forward in learning more about this vulnerable group of persons with HF and an ICD/CRT-D is to conduct qualitative studies, to learn more about the reasons for a lack of perceived social support and how they believe they want to be supported. Finally, our study confirms and underlines the fact that there is a complex relationship between psychological distress, perceived control over the health condition and social support, and all three aspects need to be taken into account when developing interventions for persons with HF and an ICD/CRT-D.

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- When caring for persons with HF, and especially women, it is important to include incorporating pertinent family caregivers when designing psychoeducational support.

Table 1. Clinical and sociodemographic characteristics describing the total sample (N=1550)

	% (n)	Mean	SD
Age		67.3	9.8
Gender, female	19.5 (303)		
Household status: living alone	21.5 (331) ^a		
ICD, secondary prevention: yes	52.1 (807) ^a		
CRT-D: yes	35.9 (556) ^a		
Time since implant of ICD: <3 y	56.9 (875) ^a		
ICD related chock: yes	33.0 (505) ^a		
Experience of heart failure			
No discomfort	34.8 (540)		
Slight discomfort	50.4 (781)		
Much discomfort	14.8 (229)		
Coexisting health problems			
Total ^b		2.6	1.9
Cardiac disease	(1549) ^a	1.9	1.4
Other disease		0.7	0.9
Symptoms of depression: ^c yes	11.0 (168) ^a	3.4	3.2
Symptoms of anxiety: ^c yes	18.6 (285) ^a	4.2	3.8
Health status ^d	(1485) ^a	67.9	18.7
Perceived control			
Control ^e	(1532) ^a	8.9	3.0
Helplessness ^f	(1529) ^a	6.4	3.2

^a Some missing values.

^b Atrial fibrillation, angina pectoris, myocardial infarction, other cardiac disease, hypertension, stroke, claudicatio intermittens, diabetes mellitus, neurological disease, rheumatological disease, lung disease, renal insufficiency, and cancer.

^c > 8 indicates psychological distress, measured by Hospital Anxiety and Depression Scale.

^d Range 0-100, a high number indicates a better perceived health related quality of life, measured by EuroQoL Visual Analogue Scale.

^e Range 4-14, a high number indicates a high perceived sense of control, measured by Control Attitude Scale.

^f Range 4-14, a high number indicates a high perceived helplessness, measured by Control Attitude Scale.

Table 2. Description of perceived social support in the whole sample and comparisons between those with perceived low/medium (≤ 5) and those with high (> 5) social support (N=1550) according to The multidimensional scale of perceived social support

	<i>Mean</i>	<i>SD</i>	<i>Low/medium support (%)</i>		
Perceived social support total ^{c,d}	5.96	1.25			
<i>Support from Significant others</i> ^{c,d}	6.22	1.36	15.1		
<i>Support from Family</i> ^{c,d}	6.12	1.42	16.4		
<i>Support from Friends</i> ^{c,d}	5.53	1.57	32.3		

	<i>Low/medium support n=273</i>	<i>High support n=1277</i>	<i>Test statistic (df)</i>	<i>Confidence interval of mean difference</i>	<i>P</i>
Age, mean (SD)	65.9 (9.2)	67.6 (9.9)	- 2.53 ^b (1548)	- 2.9 to 0.4	.011
Gender, n (%)					
Female	71 (23.4)	232 (76.6)			
Male	202 (16.2)	1045 (83.8)	8.79 ^a (1)		.003
Household status, n (%) ^c					
Living alone	153 (46.2)	178 (53.8)			
Living with someone else	118 (9.8)	1092 (90.2)	238.53 ^a (1)		.000
ICD, secondary prevention: yes, n (%) ^c	142 (52.0)	665 (52.1)			ns
CRT-D: yes, n (%) ^c	111 (40.7)	445 (34.9)			ns
Time since implant of ICD: < 3 years, n (%) ^c	153 (56.3)	722 (57.0)			ns
ICD-related chock: yes, n (%) ^c	104 (38.4)	401 (31.9)	4.29 ^a (1)		.038
Experience of heart failure, n (%) ^c					
No discomfort	91 (33.3)	449 (35.2)			ns
Slight discomfort	141 (51.6)	640 (50.1)			ns
much discomfort	41 (15.0)	188 (14.7)			ns
Coexisting health problems					
Total, mean (SD) ^e	2.8 (1.9)	2.5 (1.8)	2.04 ^b (1548)	0.01-0.5	.042
Cardiac disease, mean (SD) ^c	2.0 (1.4)	1.9 (1.4)			ns
Not cardiac disease, mean (SD)	0.8 (0.9)	0.7 (0.9)			ns
Symptoms of depression: ^f , yes, n (%) ^c	71 (26.2)	97 (7.7)	78.25 ^a (1)		.000

Symptoms of anxiety: ^f , yes, n (%) ^c	95 (35.2)	190 (15.1)	59.20 ^a (1)		.000
Health status: ^g mean (SD) ^c	62.5 (18.3)	69.0 (18.6)	- 5.11 ^b (1483)	- 9.0-4.0	.000
Perceived control					
Control ^h , mean (SD) ^c	7.4 (2.8)	9.2 (2.9)	- 9.35 ^b (1530)	- 2.2 to 1.5	.000
Helplessness ⁱ , mean (SD) ^c	6.7 (3.2)	6.3 (3.2)	2.05 ^b (1527)	0.02-0.9	.041

^a. χ^2 value.

^b. Independent samples *t* test.

^c Some missing values

^d Range 1-7, a higher number indicates a better perceived social support.

^e Atrial fibrillation, angina pectoris, myocardial infarction, other cardiac disease, hypertension, stroke, claudicatio intermittens, diabetes mellitus, neurological disease, rheumatological disease, lung disease, renal insufficiency and cancer.

^f >8 indicates psychological distress, measured by Hospital Anxiety and Depression Scale.

^g Range 0-100, a higher number indicates a better health related quality of life, measured by EuroQoL 5-D Visual Analogue Scale.

^h Range 4-14, a high number indicates a high perceived sense of control, measured by Control Attitude Scale.

ⁱ Range 4-14, a high number indicates a high perceived helplessness, measured by Control Attitude Scale.

Table 3. Table presents a logistic regression using enter method, performed to determine factors associated with perceived social support, n=1410 . Model predicts low/medium (≤ 5) perceived social support.

Simple model ^d						Multiple model				
Predictors	B	SE	OR	CI	P-value	B	SE	OR	CI	P-value
Household status ^a	2.07	0.15	7.95	5.97-10.61	.000	1.99	0.16	7.31	5.35-9.98	.000
Symptoms of depression ≥ 8 ^b	1.45	0.17	4.26	3.03-6.00	.000	0.95	0.23	2.58	1.65-4.05	.000
Symptoms of anxiety ≥ 8 ^b	1.12	0.15	3.05	2.28-4.10	.000	0.62	0.20	1.85	1.25-2.74	.002
Perceived control ^c	- 0.20	0.02	0.82	0.78-0.85	.000	- 0.16	0.03	0.85	0.81-0.90	.000

Variables put in the initial model: gender, age, household status, coexisting health problems, health status, symptoms of depression and anxiety separately, perceived control, and received chocks.

Abbreviations: B, beta; CI, confidence interval; OR, odds ratio; SE, standard error.

^a 0=living alone; 1=living with someone.

^b 0 <8; 1 ≥ 8 , measured by Hospital Anxiety and Depression Scale.

^c Higher value means higher perceived control, measured by Control Attitude Scale.

^d The simple model shows bivariate associations.

Table 4. Table presents a logistic regression using Enter method, performed to determine factors associated with perceived social support from the perspective of living status, n=1410. Model predicts low/medium (≤ 5) perceived social support.

n=297						Living alone - multiple model				
Living alone - simple model ^e						Living alone - multiple model				
Predictor	B	SE	OR	CI	P	B	SE	OR	CI	P
Health status ^a	- 0.03	0.01	0.97	0.96-0.98	.000	- 0.20	0.01	0.98	0.97-0.99	.007
Symptoms of depression $\geq 8^b$	1.30	0.32	3.66	1.96-6.85	.000	0.92	0.37	2.52	1.22-5.18	.012
Perceived control ^c	- 0.21	0.04	0.81	0.74-0.87	.000	- 0.18	0.04	0.84	0.77-0.91	.000
n=1129						Living with someone - multiple model				
Living with someone - simple model ^e						Living with someone - multiple model				
Predictor	B	SE	OR	CI	P	B	SE	OR	CI	P
Gender ^d	0.73	0.22	2.08	1.35-3.19	.001	0.63	0.23	1.88	1.18-2.97	.007
Symptoms of depression $\geq 8^b$	1.46	0.24	4.30	2.67-6.89	.000	0.99	0.29	2.70	1.53-4.79	.001
Symptoms of anxiety $\geq 8^b$	1.27	0.21	3.58	2.37-5.38	.000	0.67	0.25	1.96	1.19-3.21	.008
Perceived control ^c	- 0.17	0.03	0.84	0.79-0.89	.000	- 0.13	0.03	0.87	0.82-0.93	.000

Variables put in the initial model (living alone): health status, symptoms of depression and anxiety separately, perceived control, and received chocks.

Variables put in the initial model (living with someone): gender, health status, symptoms of depression and anxiety separately, and perceived control.

Abbreviations: B, beta; CI, confidence interval; OR odds ratio; SE, standard error.

^a Higher value means better perceived health related quality of life, measured by EuroQoL-5D Visual Analogue Scale.

^b 0 = <8; 1 = ≥ 8 , measured by Hospital Anxiety and Depression Scale.

^c Higher value means higher perceived control, measured by Control Attitudes Scale

^d 0=man, 1=woman

^e The simple model shows bivariate associations .

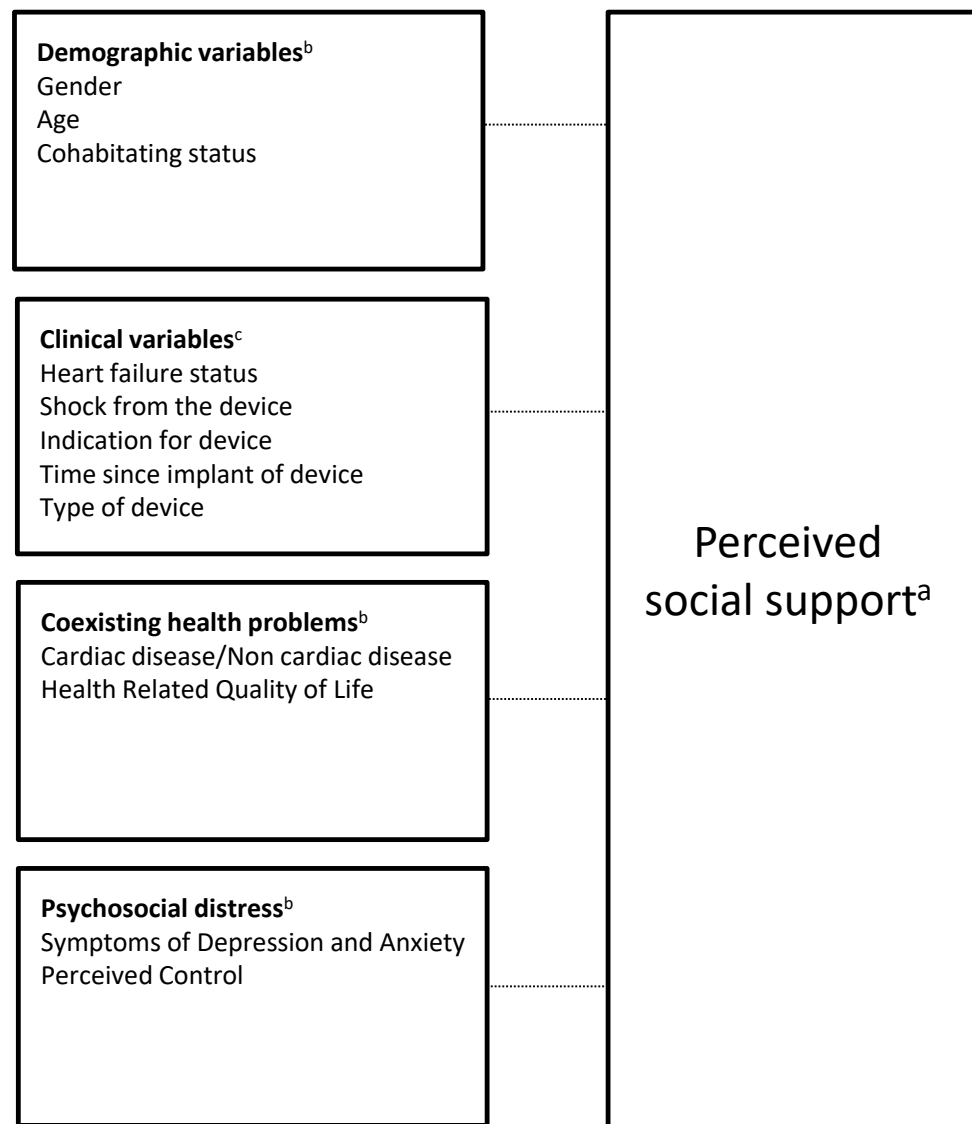


Figure 1. Variables included in the initial regression model.

a. Outcome variable.

b. Independent variables included based on theoretical relevance.

c. Independent variables included based on clinical relevance.